

REMARKS

Claim Rejections

Claims 2, 4, 8, and 10 are pending in the application, of which claims 4, 8 and 10 are withdrawn from consideration.

Claim 2 is rejected.

35 U.S.C. § 103(a) rejection

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Bayon reference in view of the Nakada reference.

Claim 2 is amended to recite a series of process steps as supported in the specification at least on pages 4 – 10.

Bayon describes that “hydrolysis reaction of In ion must be considered when the ph of aqueous solution becomes higher than 3” and “AFM measurements revealed that grain size is a function of thioacetamide and acetic acid concentrations, with larger grain size associated with slower growth rates”. However, Bayon does not disclose nor suggest that different quality of deposits in a buffer layer by stepwise regulating pH value in the first and second steps and in the range of 3.5 to 12 in the third step, as in the process of the present invention.

According to claim 2 of the present invention, the lower side deposition of the buffer layer being rich in InS is produced in the first and second steps by regulating the pH of the aqueous solution to an acidic value of the pH scale and the upper side deposition being rich in InOH•InO is produced in the third step by regulating the pH of the aqueous solution to an alkaline value (specification, as filed, page 8, lines 4-11).

However, it is disadvantageous to increase the thickness of the InS-rich deposition layer because InS has a small band gap and may reduce the optical transmittance of the buffer layer. On the contrary, the layer being rich in In(OH)₃•In₂O₃, which is obtained by regulating the pH of the aqueous solution to an alkaline value, has a larger band gap and can be used as a transparent electro-conductive layer. Thus, the layer can be formed to a larger thickness, being

free from the effect of plasma damage in the process of forming a transparent electrode and can serve as a transparent electro-conductive layer of high light transmittance in the buffer layer.

Consequently, it becomes possible to obtain a buffer layer having high optical transmittance, high adhesion to the light absorbing layer, and suitable conformity to the transparent electrode even using InS-material having a small band gap which is hard to pass light of short wavelengths (specification, as filed, page 9, line 17 to page 10, line 4).

Nakada describes the process featured by repeatedly increasing temperature from room temperature to 80° C. It is apparent from the above that Nakada has not considered increasing the light transmittance of the buffer layer by gradually increasing grain size of deposits in the buffer layer in the direction away from the substrate.

According to the present invention, the process of forming a buffer layer on a surface of the light absorbing layer is conducted in an aqueous solution by increasing temperature of the solution from room temperature to a specified temperature so as to change grain size of deposits from small to large.

Thus, the buffer layer is formed first by deposition of fine particles of InS to deposit a lower layer tightly adhered to the rough surface of the light absorbing layer with improved coverage and then by depositing an upper layer being rich in $\text{In}(\text{OH})_3 \bullet \text{In}_2\text{O}_3$ on the lower In-rich layer of smaller grain size by changing pH of the solution, thereby producing the buffer layer tightly adhered to the light absorbing layer, in which the upper layer has a large band gap instead of continuing the deposition of an InS-rich layer of inferior light transmittance.

Both the cited references (Nakada and Bayon) do not disclose the above-discussed process of the present invention, which can produce a buffer layer having a structure featured by gradually changing quality of the deposits. Therefore, Applicant respectfully submits that the present invention cannot be attained by combining the teachings of the cited references, and that claim 2 is patentable.

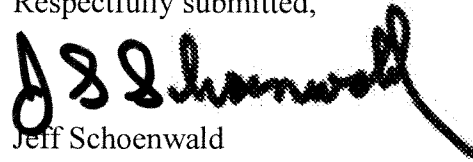
CONCLUSION

It is requested that the amendment be admitted. In light of the above discussion and now amended claim 2, it is believed that the remaining pending claim is in a condition for allowance and a notice of the same is requested. Should the Examiner have any questions, requests or suggestions, the Examiner is invited to contact the undersigned at the telephone number indicated below.

If an extension of time is required in connection with this paper, please consider this a Petition therefore to charge any fees required. Please refer to Attorney Docket 7272-137/10410482 in referring to any fees due.

Dated: August 5, 2009

Respectfully submitted,

A handwritten signature in black ink, appearing to read "J. Schoenwald", with a long, sweeping horizontal stroke extending to the right.

Jeff Schoenwald

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